

FINAL

TECHNICAL PROGRESS REPORT

For the period:

January 1, 1994, through March 31, 1994

Prepared for:

Rosebud SynCoal Partnership
Advanced Coal Conversion Process Demonstration
Colstrip, Montana

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APPENDIX A - Significant Accomplishments from Origination of Project to Date

1.0 INTRODUCTION AND PURPOSE

This report describes the technical progress made on the Advanced Coal Conversion Process (ACCP) Demonstration Project from January 1, 1994, through March 31, 1994.

The ACCP Demonstration Project is a U.S. Department of Energy (DOE) Clean Coal Technology Project. The Cooperative Agreement defining this project is between DOE and the Rosebud SynCoal Partnership. In brief, Western Energy Company, which is a coal mining subsidiary of Entech, Inc., Montana Power Company's (MPC's) non-utility group in Colstrip, Montana, was the original proposer for the ACCP Demonstration Project and Cooperative Agreement participant. To further develop the ACCP technology, Entech created Western SynCoal Company. After the formation of the Rosebud SynCoal Partnership, Western Energy Company formally novated the Cooperative Agreement to the Rosebud SynCoal Partnership to facilitate continued participation in the Cooperative Agreement. The Rosebud SynCoal Partnership is a partnership between Western SynCoal Company and Scoria, Inc., a subsidiary of NRG Energy, Inc., Northern States Power's non-utility group.

This project demonstrates an advanced, thermal, coal drying process, coupled with physical cleaning techniques, that is designed to upgrade high-moisture, low-rank coals to a high-quality, low-sulfur fuel, registered as the SynCoal® process. The coal is processed through three stages (two heating stages followed by an inert cooling stage) of vibrating fluidized bed reactors that remove chemically bound water, carboxyl groups, and volatile sulfur compounds. After thermal processing, the coal is put through a deep-bed stratifier cleaning process to separate the pyrite-rich ash from the coal.

The SynCoal® process enhances low-rank, western coals, usually with a moisture content of 25 to 55 percent, sulfur content of 0.5 to 1.5 percent, and heating value of 5,500 to 9,000 British thermal units per pound (Btu/lb), by producing a stable, upgraded, coal product with a moisture content as low as 1 percent, sulfur content as low as 0.3 percent, and heating value up to 12,000 Btu/lb.

The 45-ton-per-hour unit is located adjacent to a unit train loadout facility at Western Energy Company's Rosebud coal mine near Colstrip, Montana. The demonstration plant is sized at about one-tenth the projected throughput of a multiple processing train commercial facility. The demonstration thermal process and cooling equipment is currently near commercial size.

2.0 PROJECT PROGRESS

2.1 SIGNIFICANT ACCOMPLISHMENTS

Rosebud SynCoal Partnership's ACCP Demonstration Facility entered Phase III, Demonstration Operation, in April 1992 and operated in an extended startup mode through August 10, 1993, when the facility became commercial. The Rosebud SynCoal Partnership instituted an aggressive program to overcome startup obstacles and now focuses on supplying product coal to customers. Significant accomplishments in the history of the SynCoal® process development are shown in Appendix A. Table 2.1 lists the significant accomplishments for the year to date.

Table 2.1. Significant Accomplishments for 1994

Period	Significant Accomplishments
January 1994	<ul style="list-style-type: none"> • The plant had a 73 percent operating availability. • Shipped 18,754 tons of SynCoal® to various customers.
February 1994	<ul style="list-style-type: none"> • Project engineering was completed on a potential plant modification to add a stability enhancement process step at either 48 tph or 8 tph. • The plant had a 67 percent operating availability. • A SynCoal® blend testburn was scheduled with MPC's J.E. Corette plant.
March 1994	<ul style="list-style-type: none"> • Completed a 50/50 SynCoal® blend testburn at MPC's J.E. Corette plant. • The plant had an 82 percent operating availability. • Continued process testing to reduce spontaneous combustion tendency and dustiness.

2.2 PROJECT PROGRESS SUMMARY

The ACCP Demonstration facility set operating records during March. The facility ran from February 24 until March 9, March 11 until March 27, and from March 29 until the month's end. For the most part, the plant also ran well during the rest of the reporting period with only minor problems caused by furnace trips, two broken airlocks, an electrical interruption, a motor failure, and a bearing vibration. During this reporting period, the plant has processed over 106,117 tons of raw coal, and the facility's operating availability has dropped slightly to about 74 percent, compared to 85 percent during the Fourth Quarter of 1993. The raw coal feed rate has held at nearly 66 percent of nominal design capacity for the quarter. Year to date, about 106,117 tons of raw coal have been fed to the process, producing about 54,000 tons of the product coal. The production included a breakdown of

approximately 3,000 tons of SynCoal® product, 47,400 tons of conditioned SynCoal® product, and 129 tons of fines sold to customers and the remaining 13,000 tons of SynCoal® product which were stored in silos. A significant amount of fines were slurried to disposal since no immediate market was available. Over 50,000 tons have been test shipped.

Product stability testing and engineering were completed during this reporting period supporting a potential plant modification to add a stability enhancement process. Additionally, a post production conditioning step that lengthens the product stability life to nearly acceptable durations and allows blending was used for product shipment to MPC's J.E. Corette plant. This dust and stability treatment is a water-based treatment that inhibits dust and spontaneous combustion.

During the First Quarter of 1994, modifications and maintenance work focused on:

- repairing frozen flame scanner which tripped the furnace twice;
- repairing two broken rotary airlocks;
- repairing S-1-20 screens and motor mount;
- repairing a failed motor and bearing vibration;
- repairing stoners and separators;
- replacing process fan bearings;
- replacing miscellaneous furnace control capacitors;
- replacing blown expansion joints; and
- repairing drag conveyors C-26 and C-28.

The product produced to date has been exceptionally close to the design basis product from a chemical standpoint. The typical product analyses are shown in Table 2.2.

Table 2.2. ACCP Quarterly Analyses Summary

	TM	PA	PS	HHV	SO ₂
First Quarter Bentonite Product					
Average	3.04	9.31	0.65	11,718	1.12
Standard Deviation	0.79	0.49	0.13	140	0.22
Min.	1.63	8.11	0.47	11,206	0.81
Max.	5.75	10.69	1.11	11,970	1.94
First Quarter Standard Product					
Average	2.86	9.66	0.59	11,760	1.00
Standard Deviation	1.01	0.59	0.07	142	0.12
Min.	1.60	8.47	0.49	11,273	0.83
Max.	6.60	11.98	0.81	11,990	1.39
TM - % Total Moisture PS - % Sulfur SO ₂ - lbs. of SO ₂ /MMBtu PA - % Ash HHV - Btu/lb.					

During the next reporting period, the focus will continue on operating the ACCP Demonstration plant to support follow-up Corette testburning, serving near by end users the SynCoal® product and establishing more industrial customers, and scheduling additional testburns for the spring of 1994.

3.0 PROCESS DESCRIPTION

In general, the ACCP is a thermal and conversion process that uses combustion products and superheated steam as fluidizing gas in vibrating fluidized beds. Two fluidized stages are used to heat and dry the coal, and one water spray stage followed by one fluidized stage is used to cool the coal. Other systems that service and assist the coal conversion system include:

- Coal Conversion;
- Coal Cleaning;
- Product Handling;
- Raw Coal Handling;
- Emission Control;
- Heat Plant;
- Heat Rejection; and
- Utility and Ancillary.

3.1 ORIGINAL DESIGN PROCESS DESCRIPTION

The designed central processes are depicted in Figure 3.1 on the proceeding page. The following discusses plant design aspects and expected results. Modifications and operating results are summarized in Section 3.2.

Coal Conversion

The coal conversion is performed in two parallel processing trains. Each train consists of two, 5-feet-wide by 30-feet-long vibratory fluidized bed dryer/reactors in series, followed by a water spray section, and a 5-feet-wide by 25-feet-long vibratory cooler. Each processing train is fed up to 1,139 pounds per minute of 2-by-½ inch coal.

In the first-stage dryer/reactors, the coal is heated by direct contact with hot combustion gases mixed with recirculated dryer makegas, removing primarily surface water from the coal. The coal exits the first-stage dryer/reactors at a temperature slightly above that required to evaporate water. After the coal exits the first-stage dryer/reactor, it is gravity fed to the second-stage dryer/reactors, which further heats the coal using a recirculating gas stream, removing water trapped in the pore structure of the coal and promoting decarboxylation. The water, which makes up the superheated steam used in the second stage, is actually produced from the coal itself. Particle shrinkage that occurs in the second stage liberates ash minerals and passes on a unique cleaning characteristic to the coal.

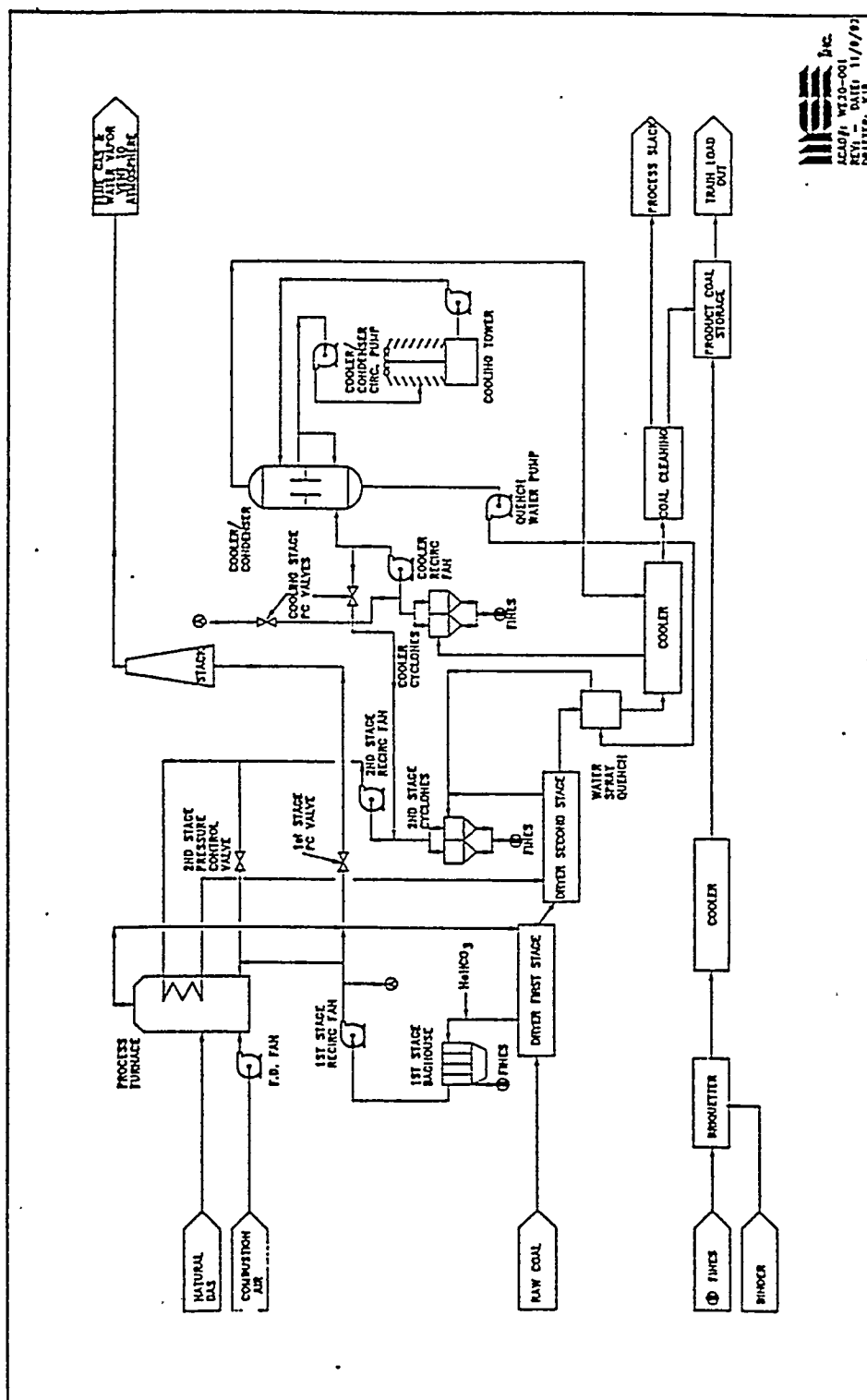


Figure 3.1 Central Processes

As the coal exits the second-stage dryer/reactors, it falls through vertical quench coolers where process water is sprayed onto the coal to reduce the temperature. The water vaporized during this operation is drawn back into the second-stage dryer/reactors. After water quenching, the coal enters the vibratory coolers where the coal is contacted by cool inert gas. The coal exits the vibratory cooler(s) at less than 150°F and enters the coal cleaning system. The gas that exits the vibratory coolers is dedusted in a twin cyclone and cooled by water sprays in direct contact coolers prior to returning to the vibratory coolers. Particulates are removed from the first-stage process gas by a pair of baghouses in parallel. The second-stage process gas is treated by a quad cyclone arrangement, and the cooler-stage process gas is treated by a twin cyclone arrangement.

Three interrelated recirculating gas streams are used in the coal conversion system; one each for the dryer/reactor stages and one for the vibratory coolers.

Gases enter the process from either the natural gas-fired process furnace or from the coal itself. Combustion gases from the furnace are mixed with recirculated makegas in the first-stage dryer/reactors after indirectly exchanging some heat to the second-stage gas stream. The second-stage gas stream is composed mainly of superheated steam, which is heated by the furnace combustion gases in the heat exchanger. The cooler gas stream is made up of cooled furnace combustion gases that have been routed through the cooler loop.

A gas route is available from the cooler gas loop to the second-stage dryer/reactor loop to allow system inerting. Gas may also enter the first-stage dryer/reactor loop from the second-stage loop (termed makegas) but without directly entering the first-stage dryer/reactor loop; rather, the makegas is used as an additional fuel source in the process furnace. The final gas route follows the exhaust stream from the first-stage loop to the atmosphere.

Gas exchange from one loop to another is governed by pressure control on each loop, and after startup, will be minimal from the first-stage loop to the cooler loop and from the cooler loop to the second-stage loop. Gas exchange from the second-stage loop to first-stage loop (through the process furnace) may be substantial since the water vapor and hydrocarbons driven from the coal in the second-stage dryer/reactors must leave the loop to maintain a steady state.

In each gas loop, particulate removal devices that remove dust from the gas streams, protect the fans. The control emissions are upstream from the fans. Particulates are removed from the first-stage process gas by a pair of baghouses in parallel. The second-stage process gas is treated by a quad cyclone arrangement, and the cooler-stage process gas is treated by a twin cyclone arrangement.

Coal Cleaning

The coal entering the cleaning system is screened into four size fractions: plus ½ inch, ½ by ¼ inch, ¼ inch by 6 mesh, and minus 6 mesh. These streams are fed in parallel to four, deep-bed stratifiers (stoners) where a rough specific gravity separation is made using fluidizing air and a vibratory conveying action. The light streams from the stoners are sent to the product conveyor, and the heavy streams from all but the minus 6 mesh stream are sent to fluidized bed separators. The heavy fraction of the minus 6 mesh stream goes directly to the waste conveyor. The fluidized bed separators, again using air and vibration to effect a gravity separation, each split the coal into light and heavy fractions. The light stream is considered product, and the heavy or waste stream is sent to a 300-ton, storage bin to await transport to an off-site user or alternately back to a mined out pit disposal site. The dried, cooled, and cleaned product from coal cleaning enters the product handling system.

Product Handling

Product handling consists of the equipment necessary to convey the clean product coal into two, 6,000-ton, concrete silos and to allow train loading with the existing loadout system.

Raw Coal Handling

Raw coal from the existing stockpile is screened to provide 2-by-½ inch feed for the ACCP process. Coal rejected by the screening operation is conveyed back to the active stockpile. Properly sized coal is conveyed to a 1000-ton, raw coal, storage bin which feeds the process facility.

Emission Control

Sulfur dioxide emission control philosophy is based on injecting dry sorbents into the ductwork to minimize the release of sulfur dioxide to the atmosphere. Sorbents, such as trona or sodium bicarbonate, are injected into the first-stage dryer gas stream as it leaves the first-stage dryers to maximize the potential for sulfur dioxide removal while minimizing reagent usage. The sorbents, having reacted with sulfur dioxide, are removed from the gas streams in the particulate removal systems. A 60-percent reduction in sulfur dioxide emissions should be realized.

The coal cleaning area fugitive dust is controlled by placing hoods over the sources of fugitive dust conveying the dust laden air to fabric filter(s). The bag filters can remove 99.99 percent of the coal dust from the air before discharge. All fines will report to a briquetter and ultimately the product stream.

Heat Plant

The heat required to process the coal is provided by a natural gas-fired process furnace, which uses process makegas from coal conversion as fuel. This system is sized to provide a heat release rate of 74 MM Btu/hr. Process gas enters the furnace and is heated by radiation and convection from the burning fuel.

Heat Rejection

Most heat rejection from the ACCP is accomplished by releasing water and flue gas into the atmosphere through an exhaust stack. The stack design allows for vapor release at an elevation great enough that, when coupled with the vertical velocity resulting from a forced draft fan, dissipation of the gases will be maximized. Heat removed from the coal in the coolers is rejected using an atmospheric-induced, draft cooling tower.

Utility and Ancillary Systems

The coal fines that are collected in the conversion, cleaning, and material handling systems are gathered and conveyed to a surge bin. The coal fines are then agglomerated and returned to the product stream.

Inert gas is drawn off the cooler loop for other uses. This gas, primarily nitrogen and carbon dioxide, is used for other baghouse pulse. The makeup gas to the cooler loop is combustion flue gas from the stack. The cooling system effectively dehumidifies and cools the stack gas making the inert gas for the system. The cooler gas still has a relatively high dew point (about 90°F). Due to the thermal load this puts on the cooling system, no additional inert gas requirements can be met by this approach.

The common facilities for the ACCP include a plant and instrument air system, a fire protection system, and a fuel gas distribution system.

The power distribution system includes a 15 kV service; a 15 kV/5 kV transformer; a 5 kV motor control center; two, 5 kV/480 V transformers; a 480 V load distribution center; and a 480 V motor control center.

The process is semi-automated, including dual control stations, dual programmable logic controllers, and distributed plant control and data acquisition hardware. Operator interface is necessary to set basic system parameters, and the control system adjusts to changes in the process measurements.

3.1.1 ORIGINAL EQUIPMENT

The originally designed and installed major equipment for the ACCP Demonstration Facility is shown in Table 3.1 on the following page.

Table 3.1. Advanced Coal Conversion Process Major Plant Equipment - As Constructed

System Description	Equipment Vendor	Type
Coal Dryers/Coolers	Carrier Vibrating Equipment, Inc.	PE
Belt Conveyors	Willis & Paul Group	MH
Bucket Elevators	FMC Corporation	MH
Coal Cleaning Equipment	Triple S Dynamics, Inc.	CC
Coal Screens	Hewitt Robbins Corporation	MH
Loading Spouts	Midwest International	MH
Dust Agglomerator	Royal Oak Enterprises, Inc.	DH
Silo Mass Flow Gates	SEI Engineers, Inc.	MH
Vibrating Bin Dischargers	Carman Industries, Inc.	MH
Vibrating Feeder	Kinergy Corporation	MH
Drag Conveyor	Dynamet	DH
Process Gas Heater	G.C. Broach Company	PE
Direct Contact Cooler	CMI-Schneible Company	PE
Particulate Removal System	Air-Cure Howden	EC
Dust Collectors	Air Cure Environmental, Inc.	EC
Air Compressors/Dryers	Colorado Compressor, Inc.	CF
Diesel Fire Pumps	Peerless Pump Company	CF
Forced Draft Fans	Buffalo Forge Company	PE
Pumps	Dresser Pump Division Dresser Industries, Inc.	PE
Electrical Equipment-4160	Toshiba/Houston International Corporation	CF
Electrical Equipment-LDC	Powell Electric Manufacturing Company	CF
Electrical Equipment-480v MCC	Siemens Energy & Automation, Inc.	CF
Main Transformer	ABB Power T&D Company	CF
Control Panels	Utility Control & Equipment Corporation	CF
Control Valves	Applied Control Equipment	CF
Plant Control System	General Electric Supply Company	CF
Cooling Tower	The Marley Cooling Tower Company	PE
Dampers	Effox, Inc.	PE
Dry Sorbent Injec. System	Natech Resources, Inc.	EC
Expansion Joints	Flexonics, Inc.	PE
MH - Materials Handling PE - Process Equipment EC - Emissions Control CF - Common Facilities CC - Coal Cleaning DH - Dust Handling		

3.2 AS-BUILT PROCESS DESCRIPTION

The ACCP has been modified as necessary during start-up and operation of the ACCP Demonstration Plant. Equipment has been improved; additional equipment installed; and new systems designed, installed, and operated to improve the overall plant performance. Those adjustments are listed below and on the following pages.

Coal Conversion System

In 1992, several modifications were made to the vibratory fluidized bed dryer/reactors and processing trains to improve plant performance. An internal process gas bypass was eliminated, and the seams were welded out to reduce system leaks. Also, the cooler bed holes were bored out in both the first stage dryers and the vibratory coolers to increase cooling gas flow.

The originally designed, two-train fines, conveying system could not keep up with the system. To operate closer to design conditions, obtain better control over operating conditions, and minimize dustiness, the ACCP plant capacity was cut in half to reduce the overall fines loading prior to modifying the fines handling system during the outage of the summer 1993. One of the two process trains was removed from service by physically welding plates inside all common ducts at the point of divergence between the two process trains. This forced process gases to flow only through the one open operating train.

In addition to the process train removal, the processed fines conveying equipment was simultaneously modified to reduce required throughput on drag conveyors. This was accomplished by adding a first-stage screw conveyor and straightening and shortening tubular drag conveyors.

The ACCP design included a briquetter for agglomeration of the process fines. However, initial shakedown of the plant required the briquetting system be completely operational. Since the briquetting operation was delayed to focus on successfully operating the plant, the process design changes included disposal of the fines by slurry to an existing pit in the mine. During the Third Quarter 1992, a temporary slurry fines disposal system was installed. The redesigned process fines conveying and handling system was commissioned. Design of a replacement fines conveying system is proceeding.

The main rotary airlocks were required to shear the pyrite and "bone" or rock that is interspersed with the coal; however, the design of the rotary airlocks was insufficient to convey this non-coal material. Therefore, the drive motors were retrofitted from 2 to 5 horse power for all eight process rotary airlocks. Also, an electrical current reversing circuit was designed, tested, and applied to the rotary airlocks. This circuitry is able to sense a rotor stall and reverse the motor to clear the obstruction.

The original plant startup tests also revealed explosion vent discrepancies in all areas, thus preventing extended operation of the plant. The design development for the vents was a cooperative effort between an explosion vent manufacturing company and the ACCP personnel and resulted in a unique explosion vent sealing system which was completed during the Second Quarter of 1993. The new explosion vent design was implemented during the Third Quarter of 1993.

Coal Cleaning

The coal entering the cleaning system is screened into four size fractions: plus ½ inch, ½ by ¼ inch, ¼ inch by 6 mesh, and minus 6 mesh. These streams are fed in parallel to four, deep-bed stratifiers (stoners) where a rough, specific, gravity separation is made using fluidizing air and a vibratory conveying action. The light streams from the stoners are sent to the product conveyor, and the heavy streams from all but the minus 6 mesh stream are sent to fluidized bed separators. The heavy fraction of the minus 6 mesh stream goes directly to the waste conveyor. The fluidized bed separators, again using air and vibration to effect a gravity separation, each split the coal into light and heavy fractions. The light stream is considered product, and the heavy or waste stream is sent to a 300-ton, storage bin to await transport back to the mined out pit disposal site. The dried, cooled, and cleaned product from coal cleaning enters the product handling system. Modifications were made in the Third Quarter of 1992 that allows product to be sent to the waste bin with minimal reconfiguration.

Product Handling

Work is continuing on testing and evaluating technologies to enhance product stabilization and reduce fugitive dustiness. During the Fourth Quarter of 1992, a liquid carbon dioxide storage and vaporization system was installed for testing product stability and providing inert gas for storage and plant startup/shutdown.

The clean product coal is conveyed into two, 5,000-ton capacity, concrete silos which allow train loading with the existing loadout system. This capacity is due to the relatively low SynCoal® density.

Raw Coal Handling

Raw coal from the existing stockpile is screened to provide 1¼-by-½ inch feed for the ACCP process. Coal rejected by the screening operation is conveyed back to the active stockpile. Properly sized coal is conveyed to a 1,000-ton, raw coal, storage bin which feeds the process facility.

Emission Control

It was originally assumed that sulfur dioxide emissions would have to be controlled by injecting chemical sorbents into the ductwork. Preliminary data indicated that the addition of chemical injection sorbent would not be necessary to control sulfur dioxide emissions under the operating conditions. A Mass Spectrometer was installed during the Second Quarter to monitor emissions and process chemistry; however, the injection system is in place should a higher sulfur coal be processed or if process modifications are made and sulfur dioxide emissions need to be reduced.

The coal-cleaning area's fugitive dust is controlled by placing hoods over the fugitive dust sources conveying the dust laden air to fabric filter(s). The bag filters appear to be effectively removing coal dust from the air before discharge. The Department of Health and Environmental Sciences completed stack tests on the east and west baghouse outlet ducts and the first-stage drying gas baghouse stack during the Second Quarter of 1993. The emission rates of 0.0013 and 0.0027 (limit of 0.018 grains/dry standard cubic feet) (gr/dscf) and 0.015 gr/dscf (limit of 0.031), respectively, are well within the limits stated in the air quality permit.

Heat Plant

The heat required to process the coal is provided by a natural gas-fired process furnace, which uses process makegas from coal conversion as fuel. The vibration problems and conversion system problems discussed previously initiated removing and redesigning the process gas fans shaft seals to limit oxygen infiltration into the process gas. This system provides a maximum heat release rate of up to 74 MM Btu/hr depending on the feed rate.

Heat Rejection

Heat removed from the coal in the coolers is rejected indirectly through cooling water circulation using an atmospheric-induced, draft-cooling tower. A substantial amount of the heat added to the system is actually lost by releasing water vapor and flue gas into the atmosphere through an exhaust stack. The stack allows for vapor release at an elevation great enough that, when coupled with the vertical velocity resulting from a forced draft fan, maximized dissipation of the gases. The evaluation from the Second Quarter indicated the problem could be resolved by producing additional makeup water to the system. A 2-inch valve was installed on the cooling water line to the cooling tower to provide the necessary makeup water.

Utility and Ancillary Systems

The coal fines that are collected in the conversion, cleaning, and material handling systems are gathered in the slurry system as produced. A replacement fines conveying system is in the process of being designed.

Inert gas is drawn off the cooler loop for other uses. This gas, primarily nitrogen and carbon dioxide, is used only for baghouse pulse. The makeup gas to the cooler loop is combustion flue gas from the stack. The cooling system effectively dehumidifies and cools the stack gas making the inert gas for the system. The cooler gas still has a relatively high dew point (about 90°F). Due to the thermal load this puts on the cooling system, no additional inert gas requirements can be met by this approach.

The common facilities for the ACCP include a plant and instrument air system, a fire protection system, and a fuel gas distribution system.

The power distribution system was upgraded by installing an uninterruptible power supply (UPS) during the Second Quarter. The UPS system does not keep the plant running if there is a problem; however, it does keep the control system, emergency systems, and office lights operating.

The process is semi-automated including dual control stations, dual programmable logic controllers, and distributed plant control and data acquisition hardware. Graphic interface programs are continually being modified and upgraded to improve the operator interface and provide more reliable information to the operators and engineers.

3.2.1 MODIFIED OR REPLACED EQUIPMENT

Facility modifications and maintenance work to date have been dedicated to obtaining an operational facility.

The modifications to the original system performed for the year to date (with modifications during this reporting period shown in bold print) involved:

First Quarter of 1994:

Processed Fines Handling System:

- Modifications, except for the processed fines cooler performance testing which is not yet scheduled, have been completed.
- Repairing S-1-20 screens and motor mount.

Particulate Removal System:

- Repairing two broken rotary airlocks.
- Repairing stoners and separators.

Forced Draft Fans:

- Repairing motor/bearing vibration.
- Replacing process fan bearings.

Process Gas Heater:

- Replacing blown expansion joints.
- Repairing two furnace trips (frozen flame scanner).

Drag Conveyor:

- Repairing drag conveyors C-26 and C-28.

General:

- Replacing miscellaneous furnace control capacitors.

Table 3.2 shows the equipment that has either been modified or replaced from plant startup. If replacement was required, the new equipment is listed.

Table 3.2. Advanced Coal Conversion Process Modified Major Plant Equipment

System Description	Equipment Vendor	Type	Modified No/Yes	Replaced With
Coal Dryers/Coolers	Carrier Vibrating Equipment, Inc.	PE	/✓	
Belt Conveyors	Willis & Paul Group	MH	/	
Bucket Elevators	FMC Corporation	MH	/	
Coal Cleaning Equipment	Triple S Dynamics, Inc.	CC	/	
Coal Screens	Hewitt Robbins Corporation	MH	/✓	
Loading Spouts	Midwest International	MH	/	
Dust Agglomerator	Royal Oak Enterprises, Inc.	DH	/	
Silo Mass Flow Gates	SEI Engineers, Inc.	MH	/	
Vibrating Bin Dischargers	Carman Industries, Inc.	MH	/	
Vibrating Feeder	Kinergy Corporation	MH	/	
Processed Fines Handling Sys. Bucket Elevators Screw Conveyors Drag Conveyors Processed Fines Cooler Slurry Tank Agitator Slurry Tank Slurry and Pit Pumps Processed Fines Load Out Bin	Continental Screw Conveyor Corp. Continental Screw Conveyor Corp. AshTech Corporation Cominco Engineering Services, Ltd. Chemineer, Inc. Empire Steel Manufacturing Co. Goulds Pumps/Able Technical P & S Fabricators	DH DH DH DH DH DH DH DH	Added Added Added Added Added Added Added Added	
Process Gas Heater	G.C. Broach Company	PE	/	
Direct Contact Cooler	CMI-Schneible Company	PE	/✓	
Particulate Removal System	Air-Cure Howden	EC	/✓	
Dust Collectors	Air Cure Environmental	EC	/	
Air Compressors/Dryers	Colorado Compressor, Inc.	CF	/✓	
Diesel Fire Pumps	Peerless Pump Company	CF	/	
Forced Draft Fans	Buffalo Forge Company	PE	/✓	
Pumps	Dresser Pump Division Dresser Industries, Inc.	PE	/	
Electrical Equipment-4160	Toshiba/Houston International Corp.	CF	/	
Electrical Equipment-LDC	Powell Electric Manufacturing Corp.	CF	/	
Electrical Equipment-480v MCC	Siemens Energy & Automation, Inc.	CF	/	
Uninterruptible Power Supply	Best Power Technologies Company	CF	Added	
Main Transformer	ABB Power T&D Company	CF	/	
Control Panels	Utility Control & Equipment Corp.	CF	/	
Control Valves	Applied Control Equipment	CF	/	
Plant Control System	General Electric Supply Company	CF	/✓	

Table 3.2. Advanced Coal Conversion Process Modified Major Plant Equipment (cont'd.)

Cooling Tower	The Marley Cooling Tower Company	PE	/✓	
Dampers	Effox, Inc.	PE	/	
Dry Sorbent Injec. System	Natech Resources, Inc.	EC	/	
Expansion Joints	Flexonics, Inc.	PE	/✓	
MH - Materials Handling CF - Common Facilities	PE - Process Equipment CC - Coal Cleaning	EC - Emissions Control DH - Dust Handling		

4.0 TECHNICAL PROGRESS

4.1 FACILITY OPERATIONS/PLANT PRODUCTION

Table 4.1 summarizes the ACCP Demonstration Facility's operations and plant production levels that have been achieved throughout this reporting period and the facility's lifetime to date. Table 4.2 lists the ACCP Demonstration Facility's monthly shipments of the SynCoal® product.

The following calculations were used in Table 4.1:

- Period Hours = Days in Reporting Period x 24 Hours/Day
- Operating Availability = Operating Hours/Period Hours x 100
- Average Feed Rate = Tons Fed/Operating Hours
- Forced Outage Rate = Forced Outage Hours/(Forced Outage Hours + Operating Hours) x 100

The difference between the feed coal and the amount of clean coal produced is due to water loss; samples removed for analysis; and processed fines, which are captured in the dust handling system and returned to the mine for disposal. Very little dust is actually lost to the atmosphere.

Approximately 40,326 tons of conditioned product coal were shipped to MPC's Corette Power Plant in Billings, Montana; 1,026 tons of untreated product coal were shipped to MPC's Colstrip Project, Units 3 and 4; 1,971 tons of product were shipped to Bentonite Corporation; 8,261 tons of conditioned product coal were shipped to Ash Grove Cement in Montana City; and 45 tons of fines were sent to Continental Lime.

Table 4.1. ACCP Demonstration Project Monthly Operating Statistics

Month	Operating Hours	Operating Availability	Maintenance Hours	Forced Outage Hours	Forced Outage Rate	Feed Tons	Ave. Feed Rate	Feed Capacity Factor	Total Shipments	Ending Silo Inventory
Jan. '94	543	73.0%	88	113	17.2%	34,979	64.4	91.5%	18,755	2,300
Feb. '94	448	67.0%	54	170	27.5%	29,247	65.3	84.7%	7,369	7,200
Mar. '94	608	82.0%	39	97	13.8%	41,891	68.9	109.6%	24,351	3,550
1st Quarter 1994 Summary	1,599	74.0%	181	380	5.12%	106,117	66.4	95.6%	50,475	3,550
LTD Totals	7,048		6,351			292,224	41.5		113,569	

Table 4.2. ACCP Demonstration Project Monthly Shipments

Month	Total Shipments	Industrial (In tons)		Specialty (In tons)		Utility (In tons)	
		Total Granular	Total Fines	Total Granular	Total Fines	Total Granular	Total Fines
Jan. '94	by rail/truck	2,537	0	640	0	15,916	0
Feb. '94	by rail/truck	3,677	0	546	0	3,686	0
Mar. '94	by rail/truck	2,047	42	743	45	21,750	0
1st Quarter 1994 Summary		8,261	42	1,929	45	41,352	0
LTD Totals		8,261	42	1,929	45	41,352	0

4.2 FACILITY TESTING

The facility testing to date has focused on controlling spontaneous combustion of the cleaned coal product. No specific testing was conducted during the First Quarter of 1994. This break in testing allowed plant personnel to review results to date and determine necessary plant modifications so as to include product stabilization processes.

4.3 PRODUCT TESTING

The product produced to date has been exceptionally close to the design basis product from a chemical standpoint but has not been acceptable from a physical standpoint due to instability (spontaneous heating) and dustiness. The typical product analyses are shown in Table 4.3. A series of tests (described in Section 5.0) were conducted throughout 1992 and 1993 to develop a method to increase the product stability. The following tests and online product trials were conducted at the ACCP site:

- treatment of SynCoal® with carbon dioxide and shipment to users;
- bench testing to characterize SynCoal® oxidation;
- treatment of SynCoal® with a variety of pore blocking compounds and shipment to users;
- blending of SynCoal® with raw coal and shipment to users;
- rehydration of SynCoal® and shipment to users; and
- full-scale testing of pile management and farming practices.

The test results indicated that a conceptual design of a stabilization process step should be developed to evaluate budgets and technical risks for incorporation into the existing ACCP Demonstration Facility.

4.4 TESTBURN PRODUCT

MPC's J.E. Corette station completed a combustion test with a 50 percent DSE conditioned SynCoal®/50 percent raw Rosebud coal blend and the plant operating at 160 MW gross. The 50/50 blend test began March 1, 1994, and ended on March 28, 1994. The J.E. Corette plant's CEM-measured SO₂ emissions dropped from the normal 1.45 lbs. of SO₂/MMBtu to less than 1.15 lbs. of SO₂/MMBtu.

Table 4.3 ACCP Quality Analyses for 1994 First Quarterly Report

RAW COAL									
FIRST QUARTER, 1994	SAMPLE ID	SAMPLE DATE	TM	PA	PS	HHV	SO ₂	COMMENTS	
RAW COAL	2757	01/19/94	26.31	8.02	0.62	8,723	1.42	SAMPLER (07CC011) SAMPLE REJECTED BY JEFF RICHARDS!!	
	2756	01/21/94	25.52	8.83	0.77	8,946	1.72	SAMPLER 18 CARS (09CC011) NON REPRESENTATIVE SAMPLE PER	
	2202	03/14/94	25.72	8.39	0.63	8,738	1.44	RAW COAL (27CC011)	
	2955	03/22/94	22.94	8.92	0.65	8,889	1.46	RAW AREA "D" COAL (29CC011)	
	2989	03/24/94	26.54	8.13	0.73	8,670	1.68	AREA "D" COAL	
	AVERAGE		25.41	8.46	0.68	8,793	1.55		
	STANDARD DEVIATION		1.29	0.36	0.06	105	0.13		
	MIN		22.94	8.02	0.62	8,670	1.42		
	MAX		26.54	8.92	0.77	8,946	1.72		

LEGEND					
TM	% Total Moisture				
PA	% Ash				
PS	% Sulfur				
HHV	Btu/lb				
SO ₂	lbs of SO ₂ /MMBtu				

Table 4.3 ACCP Quality Analyses for 1994 First Quarterly Report (continued)

BENTONITE PRODUCT										
FIRST QUARTER, 1994	SAMPLE ID	SAMPLE DATE	TM	PA	PS	HHV	SO2	COMMENTS		
BENTONITE PRODUCT	2247	01/04/94	3.02	8.72	0.57	11,742	0.97	BENTONITE		
	2261	01/07/94	4.20	8.11	0.57	11,657	0.98	BENTONITE		
	2267	01/10/94	2.64	8.95	0.63	11,794	1.07	BENTONITE		
	2302	01/11/94	2.72	9.18	0.63	11,799	1.07	BENTONITE FROM T-95		
	2301	01/12/94	2.44	9.61	0.86	11,736	1.47	BENTONITE		
	2321	01/13/94	2.62	8.81	0.63	11,806	1.07	BENTONITE		
	2322	01/14/94	3.06	9.12	0.59	11,768	1.00	BENTONITE		
	2339	01/17/94	3.04	9.61	0.54	11,718	0.92	BENTONITE (VERY SMALL SAMPLE)		
	2338	01/19/94	2.39	9.41	0.55	11,853	0.93	BENTONITE		
	2334	01/20/94	2.57	9.28	0.54	11,817	0.91	BENTONITE		
	2356	01/21/94	2.32	9.01	0.67	11,888	1.13	BENTONITE		
	2362	01/24/94	2.48	9.43	0.54	11,824	0.91	BENTONITE		
	2363	01/25/94	2.65	9.43	0.76	11,521	1.32	BENTONITE		
	2377	01/26/94	2.65	9.17	0.70	11,810	1.19	BENTONITE		
	2404	01/27/94	2.47	9.12	0.65	11,824	1.10	BENTONITE		
	2376	01/28/94	3.03	10.42	0.47	11,661	0.81	BENTONITE		
	2386	01/31/94	2.41	8.82	0.61	11,853	1.03	BENTONITE		
	2387	02/02/94	1.84	9.83	0.57	11,812	0.97	BENTONITE		
	2383	02/03/94	1.87	9.12	0.77	11,833	1.30	BENTONITE		
	2427	02/04/94	1.63	9.66	0.61	11,970	1.02	BENTONITE		
	2449	02/09/94	2.32	9.03	0.74	11,870	1.25	BENTONITE		
	2447	02/10/94	2.46	9.54	0.78	11,788	1.32	BENTONITE		
	2445	02/10/94	2.71	8.79	0.67	11,206	1.20	BENTONITE		
	2479	02/16/94	2.88	10.69	0.53	11,662	0.91	BENTONITE		
	2480	02/16/94	2.72	9.25	0.61	11,752	1.04	BENTONITE		
	2478	02/17/94	2.38	9.65	0.59	11,827	1.00	BENTONITE		
	2471	02/18/94	2.76	10.17	0.57	11,700	0.97	BENTONITE		
	2491	02/23/94	2.51	9.24	0.65	11,822	1.10	BENTONITE		
	2499	02/24/94	2.65	9.79	0.58	11,777	0.98	BENTONITE		
	2896	02/25/94	3.21	9.37	0.63	11,709	1.08	BENTONITE		
	2903	02/28/94	3.01	8.34	0.59	11,819	1.00	BENTONITE		
	2502	03/01/94	3.08	9.76	0.55	11,709	0.94	BENTONITE		
	2926	03/02/94	5.75	8.62	0.64	11,396	1.12	BENTONITE		
	2939	03/04/94	3.07	9.81	0.95	11,681	1.63	BENTONITE		
	2515	03/07/94	3.24	9.10	0.62	11,766	1.05	BENTONITE		
	2509	03/08/94	2.89	8.92	0.58	11,786	0.98	BENTONITE		

Table 4.3 ACCP Quality Analyses for 1994 First Quarterly Report (continued)

BENTONITE PRODUCT (continued)								
	2516	03/09/94	2 99	889	057	11,794	0 97	BENTONITE
	2547	03/10/94	3 50	891	072	11,690	1 23	BENTONITE
	2504	03/11/94	2 96	956	073	11,730	1 24	BENTONITE
	2552	03/15/94	3 29	940	051	11,687	0 87	BENTONITE
	2542	03/16/94	3 84	918	074	11,626	1 27	BENTONITE
	2543	03/17/94	3 92	934	060	11,666	1 03	BENTONITE
	2559	03/19/94	3 53	910	072	11,756	1 22	BENTONITE
	2544	03/21/94	3 86	962	081	11,577	1 40	BENTONITE
	2999	03/24/94	3 37	906	056	11,750	0 95	BENTONITE
	2997	03/25/94	4 69	897	059	11,536	1 02	BENTONITE
	2998	03/28/94	3 83	912	067	11,620	1 15	BENTONITE
	3007	03/29/94	4 26	995	111	11,436	1 94	BENTONITE (TRUCK)
	3001	03/29/94	4 35	1016	105	11,419	1 84	BENTONITE
	3005	03/30/94	4 84	902	061	11,549	1 06	BENTONITE
	2570	03/31/94	2 19	978	057	11,835	0 96	BENTONITE
	AVERAGE		3 04	931	065	11,718	1 12	
	STANDARD DVIATION		0 79	0 49	0 13	140	0 22	
	MIN		1 63	8 11	0 47	11,206	0 81	
	MAX		5 75	10 69	1 11	11,970	1 94	

LEGEND	
TM	% Total Moisture
PA	% Ash
PS	% Sulfur
HHV	Btu/lb
SO2	lbs of SO2/MMBtu

Table 4.3 ACCP Quality Analyses for 1994 First Quarterly Report (continued)

STANDARD PRODUCT									
FIRST QUARTER, 1994									
STANDARD PRODUCT	2200	01/01/94	2.55	10.59	0.51	11.754	0.87	STD PROD TO T-95	
	2203	01/02/94	2.24	10.26	0.51	11.824	0.86	STD PROD TO T-95	
	2237	01/03/94	2.62	9.49	0.56	11.785	0.95	STD PROD TO MPC	
	2248	01/04/94	2.20	9.00	0.55	11.948	0.92	STD PROD TO MPC	
	2246	01/04/94	6.60	9.09	0.65	11.273	1.15	FROM SAMPLER	
	2263	01/06/94	3.17	8.52	0.53	11.765	0.90	ASH GROVE SAMPLER	
	2236	01/06/94	3.41	8.47	0.52	11.735	0.89	STD PROD TO CORETTE HAND SAMPLE	
	2260	01/07/94	1.82	9.26	0.52	11.944	0.87	STD PROD TO T-95	
	2262	01/08/94	1.69	9.74	0.51	11.893	0.86	STD PROD TO T-95	
	2265	01/09/94	1.87	9.07	0.52	11.930	0.87	STD PROD TO T-95	
	2264	01/10/94	3.01	8.94	0.60	11.779	1.02	SAMPLER	
	2266	01/10/94	1.97	10.22	0.55	11.830	0.93	STD PROD TO T-95	
	2299	01/11/94	2.12	9.93	0.53	11.791	0.90	STD PROD TO T-95	
	2300	01/12/94	3.52	9.09	0.58	11.673	0.99	SAMPLER (94SY007)	
	2303	01/12/94	1.96	10.19	0.54	11.856	0.91	STD PROD TO T-95	
	2312	01/12/94	4.05	9.09	0.64	11.621	1.10	SAMPLER (05CC011)	
	2313	01/13/94	2.19	9.57	0.58	11.844	0.98	STD PROD TO T-95	
	2325	01/14/94	2.50	9.04	0.62	11.854	1.05	SAMPLER (94SY008)	
	2326	01/14/94	2.47	9.16	0.63	11.861	1.06	SAMPLER (06CC011)	
	2324	01/14/94	1.71	10.28	0.58	11.887	0.98	STD PROD TO T-95	
	2323	01/15/94	1.93	9.65	0.56	11.932	0.94	STD PROD TO T-95	
	2333	01/16/94	1.60	10.19	0.56	11.872	0.94	STD PROD TO T-95	
	2340	01/17/94	2.33	9.93	0.55	11.806	0.93	STD PROD TO T-95	
	2336	01/19/94	2.00	10.27	0.60	11.836	1.01	STD PROD TO T-95	
	2332	01/19/94	2.35	10.21	0.74	11.751	1.26	STD PROD TO T-95	
	2337	01/20/94	1.97	9.48	0.54	11.903	0.91	STD PROD TO T-95	
	2335	01/21/94	2.06	10.24	0.51	11.853	0.86	STD PROD TO T-95	
	2365	01/22/94	1.92	10.13	0.53	11.866	0.89	STD PROD TO T-95	
	2372	01/23/94	1.82	10.08	0.52	11.941	0.87	STD PROD TO T-95	
	2364	01/25/94	2.27	9.96	0.54	11.834	0.91	STD PROD TO T-95	
	2758	01/25/94	3.06	9.33	0.73	11.722	1.25	3 CARS (10CC011)	
	2759	01/25/94	3.56	9.16	0.75	11.673	1.28	SAMPLER (94SY014)	
	2371	01/28/94	2.39	9.83	0.49	11.793	0.83	STD PROD TO T-95	
	2378	01/28/94	3.15	9.43	0.54	11.764	0.92	SAMPLER ASTM (11CC011)	
	2765	01/28/94	3.80	9.36	0.57	11.660	0.98	SAMPLER (94SY016)	
	2380	01/29/94	5.68	9.06	0.77	11.306	1.36	STD PROD TO T-95 RE-RUN PER ART VIAL	

Table 4.3 ACCP Quality Analyses for 1994 First Quarterly Report (continued)

STANDARD PRODUCT (continued)							
2375	01/29/94	5.47	9.18	0.79	11,363	1.39	STD PROD TO T-95
2382	01/30/94	1.63	9.39	0.57	11,990	0.95	STD PROD TO T-95
2384	01/31/94	1.70	10.33	0.57	11,874	0.96	STD PROD TO T-95
2381	02/01/94	1.93	9.77	0.56	11,879	0.94	STD PROD TO T-95
2385	02/02/94	2.02	9.31	0.81	11,808	1.37	STD PROD TO T-95
2405	02/03/94	1.61	9.67	0.57	11,563	0.95	STD PROD TO T-95
2428	02/04/94	2.92	9.46	0.73	11,717	1.25	SAMPLER (94SY2020)
2416	02/04/94	1.89	9.85	0.57	11,913	0.96	STD PROD TO T-95
2430	02/05/94	1.84	10.16	0.59	11,863	0.99	STD PROD TO T-95
2429	02/06/94	1.90	9.68	0.80	11,906	1.34	STD PROD TO T-95
2442	02/07/94	2.47	10.76	0.59	11,773	1.00	STD PROD TO T-95
2444	02/08/94	1.97	10.01	0.64	11,775	1.09	STD PROD TO T-95
2452	02/09/94	2.75	10.90	0.66	11,656	1.13	STD PROD TO T-96
2448	02/10/94	3.16	11.98	0.65	11,533	1.13	STD PROD TO T-96
2446	02/11/94	2.84	11.79	0.65	11,533	1.13	STD PROD TO T-96
2450	02/11/94	2.07	9.36	0.59	11,939	0.99	STD PROD TO T-95
2453	02/12/94	2.09	9.44	0.54	11,933	0.91	STD PROD TO T-95
2454	02/13/94	2.49	9.32	0.58	11,847	0.98	60 MESH REPEATER
2453	02/13/94	2.49	9.32	0.55	11,882	0.93	STD PROD TO T-96
2451	02/14/94	2.23	9.67	0.54	11,848	0.91	STD PROD TO T-96
2454	02/15/94	2.74	9.69	0.59	11,746	1.00	STD PROD TO T-96
2894	02/17/94	4.16	9.48	0.70	11,622	1.20	SAMPLER (94SY025)
2501	02/25/94	2.31	10.01	0.53	11,851	0.89	STD PROD TO T-95
2498	02/25/94	2.23	9.09	0.54	11,942	0.90	STD PROD TO T-95
2897	02/25/94	3.89	8.88	0.67	11,699	1.15	SAMPLER (94SY027)
2500	02/25/94	2.48	9.36	0.53	11,892	0.89	STD PROD TO T-95
2517	02/27/94	3.07	9.72	0.58	11,846	0.98	STD TO T-95 & T-96
2802	02/28/94	4.74	9.74	0.64	11,540	1.11	STD PROD TO T-95
2805	03/01/94	4.61	9.25	0.55	11,566	0.95	STD PROD TO T-95
2511	03/02/94	3.84	9.26	0.58	11,627	1.00	SAMPLER 22CC011
2510	03/02/94	2.31	9.73	0.59	11,826	1.00	STD PROD TO T-95
2518	03/04/94	1.67	9.92	0.57	11,849	0.96	STD PROD TO T-95
2507	03/04/94	2.09	8.84	0.65	11,929	1.09	C-9-12
2512	03/04/94	2.24	10.58	0.64	11,749	1.09	STD PROD TO T-95
2513	03/04/94	2.07	8.98	0.65	11,866	1.10	C-9-12
2505	03/05/94	1.99	9.80	0.58	11,861	0.98	STD PROD TO T-95
2520	03/05/94	2.67	9.49	0.60	11,843	1.01	STD PROD TO T-95 & T-96

Table 4.3 ACCP Quality Analyses for 1994 First Quarterly Report (continued)

STANDARD PRODUCT (continued)									
2938	03/06/94	2.06	10.02	0.63	11.829	1.07	24CC011		
2514	03/06/94	2.29	10.03	0.65	11.818	1.10	24CC011 C-9-12		
2506	03/07/94	3.19	10.14	0.61	11.698	1.04	STD PROD TO T-96		
2508	03/08/94	3.52	10.39	0.50	11.618	0.86	STD PROD TO T-95		
2519	03/11/94	3.14	9.11	0.52	11.780	0.88	STD PROD TO T-96		
2940	03/12/94	5.14	9.39	0.53	11.460	0.92	STD PROD TO T-96		
2936	03/13/94	3.37	9.58	0.55	11.733	0.94	STD PROD TO T-96		
2925	03/14/94	4.22	9.56	0.63	11.618	1.08	12 BELT (27CC011)		
2956	03/14/94	4.02	9.27	0.68	11.586	1.17	12 BELT (27CC011)		
2546	03/14/94	3.57	9.91	0.52	11.646	0.89	STD PROD TO T-96		
2541	03/15/94	3.18	9.75	0.56	11.682	0.96	STD PROD TO T-96		
2550	03/16/94	2.80	10.48	0.54	11.707	0.92	ST PROD TO T-96		
2957	03/16/94	3.46	9.24	0.65	11.728	1.11	12 BELT (28CC011)		
2950	03/16/94	3.37	9.24	0.62	11.746	1.06	12 BELT (28CC011)		
2548	03/17/94	3.24	9.71	0.52	11.746	0.89	STD PROD TO T-96		
2545	03/18/94	2.69	10.08	0.58	11.789	0.98	STD PROD TO T-96		
2564	03/19/94	3.06	10.24	0.60	11.721	1.02	STD PROD TO T-96		
2549	03/20/94	3.10	9.77	0.56	11.740	0.95	STD PROD TO T-96		
2551	03/21/94	3.54	10.16	0.55	11.615	0.95	STD PROD TO T-96		
2958	03/22/94	4.70	8.81	0.68	11.533	1.18	12 BELT (29CC011)		
2560	03/22/94	3.32	9.48	0.52	11.679	0.89	STD PROD TO T-96		
2959	03/22/94	4.89	8.71	0.68	11.515	1.15	12 BELT (29CC011)		
2562	03/23/94	3.65	9.20	0.54	11.601	0.93	STD PROD TO T-96		
2574	03/24/94	3.83	9.07	0.56	11.656	0.96	12 BELT (30CC011)		
2561	03/24/94	4.25	9.12	0.55	11.611	0.95	STD PROD TO T-96		
2990	03/24/94	4.78	8.36	0.58	11.531	0.97	12 BELT (30CC011)		
2563	03/25/94	2.94	9.73	0.55	11.738	0.94	STD PROD TO T-95		
2572	03/26/94	2.83	9.89	0.55	11.750	0.94	STD PROD TO T-95		
2573	03/30/94	2.47	9.38	0.55	11.852	0.93	STD PROD TO T-95		
2575	03/31/94	1.95	9.24	0.56	11.924	0.94	STD PROD TO T-95		
AVERAGE		2.86	9.66	0.59	11.760	1.00			
STANDARD DEVIATION		1.01	0.59	0.07	142	0.12			
MIN		1.60	8.47	0.49	11.273	0.83			
MAX		6.60	11.98	0.81	11.990	1.39			

LEGEND					
TM	% Total Moisture				
PA	% Ash				
PS	% Sulfur				
HIV	Btu/lb				
SO2	lbs of SO2/MMBtu				

Table 4.3 ACCP Quality Analyses for 1994 First Quarterly Report (continued)

DSE TREATED PRODUCT									
FIRST QUARTER, 1994	SAMPLE ID	SAMPLE DATE	TM	PA	PS	HHV	SO2	COMMENTS	
DSE TREATED PRODUCT	2571	01/02/94	14 20	7 72	0 52	10,431	1 00	STD PROD TO CORETTE	
	2591	01/04/94	15 41	7 64	0 52	10,252	1 01	HAND SAMPLED	
	2760	01/06/94	15 12	7 64	0 49	10 303	0 95	STD PROD TO CORETTE SAMPLER	
	2739	01/06/94	11 29	9 02	0 49	10 731	0 91	ASH GROVE HAND	
	2576	01/10/94	12 91	7 88	0 53	10,508	1 01	HAND SAMPLED	
	2589	01/12/94	14 23	7 60	0 52	10,393	1 00	HAND SAMPLED (05CC011)	
	2580	01/12/94	14 33	8 12	0 50	10,332	0 97	HAND SAMPLED (94SY007)	
	2590	01/14/94	11 96	8 11	0 60	10,623	1 13	HAND SAMPLED (94SY008)	
	2579	01/14/94	11 48	8 36	0 48	10,706	0 90	HAND SAMPLED (06CC011)	
	2584	01/18/94	11 93	8 10	0 56	10,618	1 05	LAST 5 CARS (07CC011)	
	2588	01/18/94	15 72	7 74	0 58	10,176	1 14	HAND SAMPLED (07CC011)	
	2582	01/19/94	11 26	8 62	0 48	10,690	0 90	HAND SAMPL ED CARS 20-30 (08CC011)	
	2583	01/19/94	15 12	8 00	0 59	10 210	1 16	HAND SAMPLED CARS 1-19 (08CC011)	
	2581	01/19/94	10 39	8 43	0 50	10,824	0 92	ASHGROVE	
	2587	01/21/94	14 57	7 92	0 51	10,338	0 99	HAND SAMPLED 12 CARS (09CC011)	
	2587	01/21/94	9 65	9 33	0 63	10,865	1 16	SAMPLER 12 CARS (09CC011)	
	2586	01/26/94	12 85	8 14	0 65	10,596	1 23	HAND SAMPLED (94SY014)	
	2630	01/28/94	14 14	7 72	0 54	10,377	1 04	HAND SAMPLED (94SY016)	
	2615	01/28/94	13 73	8 58	0 46	10,414	0 88	HAND SAMPLED- SAMPLE#3 (11CC011)	
	2585	01/28/94	16 40	7 83	0 51	10,124	1 01	HAND SAMPLED- SAMPLE#1 (11CC011)	
	2629	01/28/94	15 90	7 94	0 48	10,168	0 94	HAND SAMPLED- SAMPLE#2 (11CC011)	
	2626	01/31/94	10 26	8 41	0 52	10,818	0 96	SAMPLE POINT NOT ON TAG (12CC011)	
	2628	01/31/94	13 25	8 88	0 62	10,387	1 19	SAMPLE POINT NOT LISTED ON TAG (12CC011)	
	2625	02/02/94	19 22	8 94	0 83	9,546	1 74	HAND SAMPLED (94SY019)	
	2631	02/02/94	10 87	8 62	0 70	10,683	1 31	SAMPLER (94SY019)	
	2627	02/04/94	10 30	8 49	0 67	10,804	1 24	HAND SAMPLED (94SY2020)	
	2640	02/07/94	9 35	8 85	0 72	10,993	1 31	SAMPLER (94SY021)	
	2642	02/07/94	12 27	8 33	0 71	10,573	1 34	HAND SAMPLED (94SY021)	
	2624	02/09/94	10 61	8 51	0 69	10,793	1 28	HAND SAMPLED (94SY022)	
	2643	02/15/94	15 59	7 87	0 52	10,152	1 02	HAND SAMPLED (19CC011)	
	2641	02/15/94	15 90	7 78	0 49	10,147	0 97	HAND SAMPLED (94SY023)	
	2639	02/17/94	9 87	8 55	0 52	10,904	0 95	HAND SAMPLED (94SY025)	
	2644	02/19/94	11 85	8 60	0 67	10 633	1 26	HAND SAMPLED (94SY026)	
	2645	02/25/94	9 42	8 19	0 63	11,017	1 14	HAND SAMPLED (94SY027)	
	2604	02/28/94	9 41	8 48	0 51	10,958	0 93	HAND SAMPLED (25CC011)	
	2665	02/28/94	14 04	7 62	0 53	10,439	1 02	HAND SAMPLED (25CC011)	

Table 4.3 ACCP Quality Analyses for 1994 First Quarterly Report (continued)

DSE TREATED PRODUCT (continued)								
	2664	02/28/94	12.84	7.90	0.63	10.556	1.19	HAND SAMPLED (94SY029)
	2681	03/02/94	12.59	8.11	0.58	10.554	1.10	HAND SAMPLED (94SY030)
	2691	03/04/94	12.49	8.16	0.51	10.496	0.97	HAND SAMPLED 23CC011
	2697	03/04/94	13.29	7.86	0.51	10.489	0.97	HAND SAMPLED 23CC011
	2698	03/06/94	16.40	7.42	0.49	10.138	0.97	HAND SAMPLED 24CC011
	2699	03/06/94	15.68	7.96	0.50	10.193	0.98	HAND SAMPLED 24CC011
	2695	03/08/94	16.27	7.68	0.50	10.125	0.99	HAND SAMPLED (25CC011)
	2693	03/08/94	16.30	7.82	0.55	10.120	1.09	HAND SAMPLED (25CC011)
	2696	03/10/94	17.07	7.59	0.49	10.055	0.97	HAND SAMPLED (26CC011)
	2734	03/10/94	17.65	7.60	0.44	9.988	0.88	HAND SAMPLED (26CC011)
	2694	03/10/94	18.24	7.32	0.56	9.925	1.13	HAND SAMPLED (94SY035)
	2737	03/14/94	16.35	7.80	0.45	10.083	0.89	HAND SAMPLED (27CC011)
	2736	03/14/94	16.13	7.60	0.54	10.119	1.07	HAND SAMPLED (27CC011)
	2740	03/16/94	19.06	7.38	0.53	9.759	1.09	HAND SAMPLE (28CC011)
	2735	03/16/94	17.32	8.01	0.48	9.977	0.96	HAND SAMPLE (28CC011)
	2954	03/22/94	19.14	7.52	0.60	9.705	1.24	HAND SAMPLED (94SY039)
	2962	03/22/94	18.71	7.21	0.52	9.825	1.06	HAND SAMPLED (29CC011)
	2733	03/24/94	17.01	7.76	0.50	10.038	1.00	(30CC011)
	2738	03/24/94	18.77	7.58	0.57	9.789	1.16	(94SY041)
	2747	03/29/94	18.46	7.56	0.61	9.848	1.24	ASHGROVE BY HAND
	AVERAGE		14.19	8.04	0.55	10.363	1.07	
	STANDARD DEVIATION		2.88	0.47	0.08	355	0.15	
	MIN		9.35	7.21	0.44	9.546	0.88	
	MAX		19.22	9.33	0.83	11.017	1.74	

LEGEND	
TM	% Total Moisture
PA	% Ash
PS	% Sulfur
HHV	Btu/lb
SO2	lbs of SO2/MMBtu

Table 4.3 ACCP Quality Analyses for 1994 First Quarterly Report (continued)

FIRST QUARTER, 1994	SAMPLE ID	SAMPLE DATE	TM	PA	PS	HFV	SO2	COMMENTS
FINES	2763	01/30/94	1.95	11.01	0.62	11,744	1.06	CONTINENTAL LIME DUST FROM T-90
	2770	01/30/94	2.27	10.79	0.59	11,729	1.01	CONTINENTAL LIME DUST FROM T-90 RE-RUN PER ART VIAL
	2762	02/03/94	6.33	9.52	0.86	11,204	1.54	T-90 940203
	2767	02/04/94	5.01	9.47	0.81	11,382	1.42	T-90 940204B
	2774	02/04/94	6.72	10.79	0.74	10,916	1.36	T-90 930204A
	2775	02/04/94	5.91	9.70	0.91	11,207	1.62	T-90 940204C
	2417	02/05/94	2.86	9.31	0.84	11,682	1.44	T-90 940205A
	2772	02/05/94	4.96	9.54	0.80	11,362	1.41	T-90 940205C
	2773	02/05/94	4.94	9.52	0.81	11,378	1.42	T-90 940205D
	2771	02/05/94	3.20	9.84	0.97	11,625	1.67	T-90 940205B
	2516	02/05/94	3.73	9.01	0.79	11,640	1.36	T-90 940205E
	2764	02/05/94	4.17	9.27	0.85	11,540	1.47	T-90 940205G
	2768	02/05/94	4.04	9.12	0.83	11,601	1.43	T-90 940205F
	2812	02/07/94	6.23	9.16	0.87	11,177	1.56	T-90 940205H
	2811	02/07/94	4.35	9.31	0.95	11,506	1.65	T-90 940205L
	2804	02/07/94	4.81	9.18	0.80	11,489	1.39	T-90 940205M
	2766	02/07/94	5.96	8.97	0.88	11,292	1.56	T-90 940205K
	2792	02/07/94	5.52	9.01	0.85	11,357	1.50	T-90 940205J
	2813	02/08/94	4.90	9.20	0.90	11,369	1.58	T-90 940306C
	2805	02/08/94	4.71	9.07	0.82	11,507	1.43	T-90 940206B
	2833	02/08/94	3.95	9.10	0.81	11,563	1.40	T-90 940206A
	2814	02/08/94	6.12	9.36	0.86	11,314	1.52	T-90 940206D
	2837	02/09/94	5.07	9.02	0.87	11,239	1.55	T-90 940207A
	2831	02/09/94	4.57	9.07	0.83	11,505	1.44	T-90 940206F
	2834	02/09/94	4.94	9.83	0.92	11,326	1.62	T-90 940207B
	2827	02/09/94	5.03	9.25	0.92	11,400	1.61	T-90 940206E
	2835	02/10/94	4.35	10.62	1.05	11,274	1.86	T-90 210394
	2867	02/11/94	5.90	9.34	1.03	11,232	1.83	T-90 940211B
	2836	02/11/94	6.31	9.27	1.02	11,174	1.83	T-90 940211A
	2868	02/12/94	6.34	9.23	0.93	11,208	1.66	T-90 940212B
	2866	02/12/94	5.65	9.45	1.03	11,227	1.83	T-90 940212A
	2863	02/12/94	7.63	10.04	1.08	10,892	1.98	T-90 940213A
	2864	02/12/94	5.94	9.28	0.95	11,266	1.69	T-90 940213B
	2948	02/14/94	3.37	8.90	0.57	11,083	1.03	ROSSETTO SYNCOAL
	2865	02/14/94	3.31	8.76	0.56	11,329	0.99	ROSSETTO SYNCOAL
	2947	02/15/94	5.07	9.37	0.72	11,469	1.26	BENTONITE

Table 4.3 ACCP Quality Analyses for 1994 First Quarterly Report (continued)

FINES (continued)								
	2880	02/15/94	538	914	062	11,485	108	SAMPLER (18CC011)
	2878	02/16/94	511	896	082	11,438	143	T-90 940216C
	2879	02/16/94	358	920	089	11,494	155	T-90 940216A
	2869	02/16/94	556	890	081	11,344	143	T-90 940216B
	2895	02/17/94	501	860	076	11,469	133	T-90 940217A
	2892	02/17/94	513	911	086	11,398	151	T-90 940217B
	2927	03/02/94	607	888	075	11,336	132	(94SY030)
	2961	03/16/94	589	862	077	11,341	136	BENTONITE "FINE"
	2960	03/22/94	1052	1055	083	10,363	160	BENTONITE "FINE"
	3006	03/30/94	523	908	081	11,336	143	CONTINENTAL LIME T-90
	3008	03/31/94	523	941	085	11,310	150	CONTINENTAL LIME T-90
AVERAGE			509	939	084	11,351	148	
STANDARD DEVIATION			140	055	012	231	022	
MIN			195	860	056	10,363	099	
MAX			1052	1101	108	11,744	198	

LEGEND	
TM	% Total Moisture
PA	% Ash
PS	% Sulfur
HHV	Btu/lb
SO2	lbs of SO2/MMBtu

Table 4.3 ACCP Quality Analyses for 1994 First Quarterly Report (continued)

SLURRY									
FIRST QUARTER, 1994	SAMPLE ID	SAMPLE DATE	TM	PA	PS	HHV	SO ₂	COMMENTS	
SLURRY	2949	03/14/94	53.80	3.39	0.27	5,626	0.96	SLURRY SAMPLE #2	
	2935	03/14/94	49.86	3.87	0.28	6,061	0.92	SLURRY SAMPLE #1	
	AVERAGE		51.83	3.63	0.28	5,844	0.94		
	STANDARD DEVIATION		1.97	0.24	0.01	218	0.02		
	MIN		49.86	3.39	0.27	5,626	0.92		
	MAX		53.80	3.87	0.28	6,061	0.96		

LEGEND				
TM	% Total Moisture			
PA	% Ash			
PS	% Sulfur			
HHV	Btu/lb			
SO ₂	lbs. of SO ₂ /MMBtu			

5.0 PROCESS STABILITY/PILOT WORK

During the initial plant startup tests which occurred in January through June of 1992, the product was noted to be dusty and susceptible to spontaneous combustion. Stability investigations and dust mitigation tests are on-going to lower costs and continually refine the application and improve product quality. A summary of product stability and dust mitigation testing to date is described below.

5.1 PRODUCT STABILITY

The dried, cooled, and cleaned coal produced to date has exhibited spontaneous heating and combustion. When any significant mass of coal (more than 1 to 2 tons) is exposed to any significant air flow for periods ranging from 18 to 72 hours, the coal reaches temperatures necessary for spontaneous combustion or auto ignition to occur. Spontaneous heating of run-of-mine, low-rank coals has been a common problem but usually occurs after open air exposure periods of days or weeks, not hours. However, dried, low-rank coals have universally displayed spontaneous heating tendencies to a greater degree than raw, low-rank coals.

Additional process steps and applying additives to the coal both during and after the process are being tested to mitigate this problem.

Butte Pilot Plant Verification Tests

The Butte pilot plant was operated to confirm that the SynCoal® produced by the ACCP was equal in reactivity to that of the pilot plant. The spontaneous heating characteristic was not identified at the pilot stage because product was generated at a comparatively low rate which allowed enough time for the material to passively stabilize before being covered by subsequent layers of SynCoal®.

Oxidation Tests

Tests were performed on a bench-scale to determine the completeness of oxidation, the potential for accelerating the rate of oxidation, and the thermodynamics of oxidation. From these tests, the mass uptake of oxygen was determined, as well as the typical SynCoal® oxidation rate expressions. Once the oxidation test results were calculated, the values were then used to design the stabilization pilot-scale equipment.

Carbon Dioxide Trials

In the literature search on methods for controlling spontaneous combustion, carbon dioxide is described as a method to control spontaneous heating. Testing is on-going to determine the effectiveness of using carbon dioxide to prevent or delay spontaneous heating and to optimize the rate of application. However, the results from testing indicate a two- to four-fold increase in SynCoal® product life. Unfortunately, carbon dioxide is very expensive and not an economical solution to the spontaneous combustion problem.

Pore Blocking Trials

The literature search also indicated several compounds are commercially available to prevent spontaneous combustion by blocking the reactive sites on the surface of coal. Several chemicals were tested on SynCoal® at varying flow rates and concentrations. In addition to spray application tests, a pilot-scale, blender-type of application technique was tested. The trial tests indicated that extremely high chemical applications showed a marginal improvement in product stability.

Blending Trials

Based on a market analysis, it was determined that blending SynCoal® with raw coal may be an effective method of delivering fuel to market. Testing is being performed to determine the effectiveness of blending SynCoal® with raw coal in achieving a stable product, determining the optimum blend ratios, and identifying the resulting fuel characteristics. Preliminary results indicated a significant increase in the life of the SynCoal® product from blending specific quantities of product and raw coal; however, the product was extremely dusty.

Rehydration Testing and Shipping Treated SynCoal®

Based on the blending trials, rehydration is being conducted to determine the effectiveness of using water to control spontaneous combustion and to determine the optimum moisture content and water application method.

Preliminary results indicated an 8- to 16-fold increase in SynCoal® stability. The fuel value of the coal was reduced and visible water vapor was evident upon delivery of the treated product. These aspects are continuing to be evaluated to obtain optimum performance.

Pile Management Testing

Pile management tests were performed to determine whether periodic heat rejection would result in a stabilized product. Based on observations, SynCoal® can be stabilized with pile management over a two-week period. However, large land areas would be required at commercial-scale, and variable weather conditions may affect product quality.

Stabilization Process Step Pilot Testing

After ensuring operability of the equipment, process test variables, including residence time, air flow, material temperatures, feed coal size, and flow rate, were tested. Under operating conditions, the process variables were found to be dependent; therefore, care was required not to operate in a "run-away" mode. Preliminary results indicated that treated SynCoal® can be six times more stable than product just off the process.

Stabilization Process Step Demonstration Design

Based on the successful test results, a full demonstration scale process step was designed for retrofit into the ACCP. Two different designs, a slip stream at 8 tph and a full ACCP throughput 48 tph design, were cost estimated. Complete construction of this plant addition is expected to take 13 months with a full year of process and product testing.

5.2 PRODUCT DUSTINESS

The product is basically dust free when it exits the processing facility due to numerous steps where the coal is fluidized in process gas or air, which removes the dust-size particles. The gas and air entrains any dust that has been produced since the last process step.

Typical to coal handling systems, each handling activity performed on the product coal after the coal leaves the process degrades the coal size and produces some dust. The fall into the product silos, which can be up to 90 feet, can be especially degrading to the coal. Quantifying dustiness of coals is difficult, but once the product coal has passed through the nine transfer points between the process and a rail car, the coal is visibly dustier than run-of-mine coal. The SynCoal® product

is actually no dustier than the raw coal; the dust is just more fugitive. Because the SynCoal® product is dry, it does not have any inherent ability to adhere small particles to the coal surfaces. This allows any dust-size particles that are generated by handling to be released and become fugitive.

Transfer points have been modified to reduce impacts, methods of reducing degradation in the silos have been examined, and dust suppression options tested.

SynCoal® Attrition Study and Dust Suppressant Testing

SynCoal® dustiness was reviewed to determine a dust control strategy based on results obtained from attrition testing. Initial tests were accomplished with standard, water-based chemicals, which included surfactant, inorganic salts, and lignosulfonate-based suppressants. None of the products tested at normal economic concentration levels were effective at mitigating SynCoal® dustiness.

After water-based compounds proved to be ineffective for mitigating SynCoal® dustiness, more exotic and expensive compounds were tested and evaluated. These compounds included oil, anionic polymers, latex polymers, and various oil-based emulsions. Oil was found to be an effective though expensive dust suppressant when applied at the required rates; however, due to environmental concerns, oil was removed from consideration. Another effective suppressant that is also environmentally safe is an ionic polymer. However, this chemical is also expensive to apply and impacts the overall process economics. As a result of rail car testing, an effective car topping compound was located. No dust suppressant was found to work adequately on blends.

Zig-Zag Testing

In addition to spray application of chemicals, a pilot-scale, zig-zag blender was tested to apply dust suppressant compounds. The objectives of these tests were to maximize compound efficiency and to ensure spray application test results were not biased by inconsistent coating. The zig-zag blender test confirmed the results obtained by the spray method but indicated that expensive compounds could be substantially diluted with water if a more efficient application technique was used.

Chemically Enhanced Treatment Application

Tests involving adding water to the SynCoal® product in lieu of blending yielded the most promising results. Total inundation of SynCoal® with water reduced the amount of dust liberated at the point of transfer. This technique has allowed the SynCoal® product to be shipped out of the ACCP plant. The negative aspects appear to be a reduced fuel value, difficulties of winter application, and reduced acceptance of visible water vapor liberation upon delivery.

5.3 CONCLUSIONS FROM PROCESS STABILITY TESTING

- Based on the results of carbon dioxide treatment and rehydration trials, the RSCP initiated a program to produce DSE SynCoal with a 8- to 16-fold stability increase which currently enables shipment to users in the Midwest.
- Stability investigations into coal blending were successful but revealed that the coal may be too dusty to ship.
- DSE-treated SynCoal can be blended with raw coal without causing dust problems.
- Pore blocking stability investigations proved unsuccessful.
- Results of air oxidation and pile management tests were positive.

6.0 FUTURE WORK AREAS

Work continues on improving product stability and dustiness. Several unforeseen product issues, which were only identified by the demonstration project operation, have changed the required activities for the ACCP Demonstration Project. Budget modifications will have to be made to the existing contract so as to include the following tasks:

- identifying efficient and effective handling techniques;
- demonstrating the benefits of SynCoal® in the smaller, more constrained industrial boilers and older, smaller utility boilers;
- developing additional methods to reduce the product's spontaneous combustion potential; and
- demonstrating abilities to reduce production costs.

In January and February of 1994, preliminary system modifications to incorporate a stabilization process step were identified along with the associated cost estimates to determine if a conceptual design should be completed. Rosebud SynCoal Management is reviewing the information before giving a notice to proceed on this issue.

APPENDIX A

Significant Accomplishments from Origination of Project to Date

SIGNIFICANT ACCOMPLISHMENTS (SINCE CONCEPT INCEPTION)

September	1981	Western Energy contracts Mountain States Energy to review LRC upgrading concept called the Greene process.
June	1982	Mountain States Energy built and tested a small batch processor in Butte, Montana.
December	1984	Initial patent application filed for the Greene process, December 1984.
November	1984	Initial operation of a 150 lb/hr continuous pilot plant modeling the Greene thermal process at Montana Tech's Mineral Research Center in Butte, Montana.
November	1985	Added product cooling and cleaning capability to the pilot plant.
January	1986	Initiated process engineering for a demonstration-size Advanced Coal Conversion Process (ACCP) facility.
October	1986	Completed six month continuous operating test at the pilot plant with over 3,000 operating hours producing approximately 200 tons of SynCoal®.
October	1986	Western Energy submitted a Clean Coal I proposal to DOE for the ACCP Demonstration Project in Colstrip, Montana, October 18, 1986.
December	1986	Western Energy's Clean Coal proposal identified as an alternate selection by DOE.
February	1988	First U.S. patent issued February 16, 1988, No. 4, 725,337.
November	1987	Internal Revenue Service issued a private letter ruling designating the ACCP product as a "qualified fuel" under Section 29 of the IRS code, November 6, 1987.
May	1988	Western Energy submitted an updated proposal to DOE in response to the Clean Coal II solicitation, May 23, 1988.
May	1989	Second U.S. patent issued March 7, 1989, No. 4, 810,258.
December	1988	Western Energy was selected by DOE to negotiate a Cooperative Agreement under the Clean Coal I program.
June	1990	Reach a negotiated agreement with DOE on the Cooperative Agreement, June 13, 1990.

**SIGNIFICANT ACCOMPLISHMENTS (cont'd.)
(SINCE CONCEPT INCEPTION)**

September	1990	Signed Cooperative Agreement, after Congressional approval, September 13, 1990.
September	1990	Contracted project engineering with Stone & Webster Engineering Corporation, September 17, 1990.
December	1990	Formed Rosebud SynCoal Partnership, December 5, 1990.
December	1990	Started construction on the Colstrip site.
March	1991	Novated the Cooperative Agreement to the Rosebud SynCoal Partnership, March 25, 1991.
March	1991	Formal ground breaking ceremony in Colstrip, Montana, March 28, 1991.
December	1991	Initiated commissioning of the ACCP Demonstration Facility.
April	1992	Completed construction of the ACCP Demonstration Facility and entered Phase III, Demonstration Operation.
June	1992	Formal dedication ceremony for the ACCP Demonstration Project in Colstrip, Montana, June 25, 1992.
August	1992	Successfully tested product handling by shipping 40 tons of SynCoal® product to MPC's Unit #3 by truck.
October	1992	Completed 81 hour continuous coal run 10/2/92.
November	1992	Converted to a single process train operation.
December	1992	Produced a passivated product with a two-week storage life.
January	1993	Produced 200 tons of passivated product that lasted 13 days in the open storage pile.
February	1993	The plant had a 62 percent operating factor between January 1 and February 15.
March	1993	Identified an environmentally compatible dust suppressant that inhibits fugitive dust from the SynCoal® product. Completed annual MSHA safety training.
May	1993	Tested nearly 700 tons of BNI lignite as a potential process feedstock achieving approximately 11,000 Btu/lb heating value and substantially reducing the sulfur in the resultant product.

**SIGNIFICANT ACCOMPLISHMENTS (cont'd.)
(SINCE CONCEPT INCEPTION)**

May	1993	Tested over 500 tons of BNI lignite.
June	1993	Initiated deliveries of SynCoal® under long-term contracts with industrial customer.
July	1993	Identified a conditioned method that inhibits spontaneous combustion and dust.
August	1993	State evaluated emissions, and the ACCP process is in compliance with air quality permit. ACCP Demonstration Facility went commercial on August 10, 1993.
September	1993	Stored approximately 9,000 tons of SynCoal® in inerted product silos and stabilized 2,000 to 3,000 tons in a managed open stockpile.
September	1993	Operated at an 84 percent operating factor and a 62 percent capacity factor for the month.
September	1993	Tested nearly 700 tons of BNI lignite as a potential process feedstock achieving approximately 11,000 Btu/lb heating value and substantially reducing the sulfur in the resultant product.
September	1993	Tested over 500 tons of BNI lignite.
October	1993	Processed more coal since resuming operation in August than during the entire time from initial startup with the summer's maintenance outage (approximately 15 months).
October	1993	Tested North Dakota lignite as a potential process feedstock, achieving nearly 11,000 Btu/lb heating value and substantially reducing the sulfur content in the resultant product.
November	1993	Operated at an 88 percent operating factor and a 74 percent capacity factor for the month.
December	1993	Shipped 16,951 tons of SynCoal® to various customers.
January	1994	Shipped 18,754 tons of SynCoal® to various customers.
February	1994	The plant had a 67 percent operating availability.
March	1994	Successfully completed a 50/50 SynCoal® blend testburn at MPC's J.E. Corette plant.